Technical Bulletin #50:

Seedling Production in Trays

The use of good quality seedlings is a fundamental part of the Cambodia HARVEST technical program for vegetable production. By using seedling trays, growers can produce healthier, more uniform and vigorous seedlings and allow for field planting without disturbing the root system. The use of seed trays for seedling production is a common practice in modern agriculture.

The ideal seedling is compact, has a thick stem, a well developed root system, is dark green in color, and has to have four true leaves.

The following steps are recommended to produce good seedlings:

1. **Seed Source**: Use certified seeds. The use of seeds taken from your own farm or garden should be avoided as it may carry certain diseases or viruses that are seed borne and, if they come from hybrid varieties, they will produce plants with different characteristics.

A healthy seedling with a well-developed root system.

2. **Amount of Seed**: Estimate the amount of seed needed based on the planting density and the percentage seed germination (given on the label). Normally, between 3% and 10% more seed is used (10% for varieties, 3% for hybrids) in order to be able to replant any seedlings that die the first week after transplanting in the field. Only plant one seed per hole (or plug).

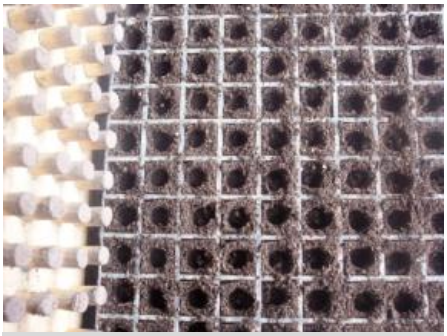
3. **Seedling Tray Selection**: If choices are available, the hard plastic seed trays are preferred, 128 to 200 cells.

4. **Seedling Tray Preparation**: Disinfect the trays before use with chlorinated water at 100 ppm by submerging for 20 minutes. With calcium hypochlorite at 65%, use 25 cc in a 200 liter drum. A 200 liter drum can treat at least 300 trays. An alternative disinfection method is to treat the trays in hot water (72°C) for 45 minutes.

Disinfecting trays with chlorinated water.

5. **Substrate Preparation**: There are different methods to prepare soil medium, but the key to making a good growth medium is to make a correct mix of materials (substrate must have good water retention capacity while also allow for adequate drainage) and to use sterilized materials to prevent soil borne diseases. Our recommendation is to mix fine compost, fine peat soil, and burnt rice hulls or old saw dust in 1:1:2 ratio. These materials are available and easy to find locally. Once you have mixed all the materials together, wet them very well to germinate all weed seeds and also to activate bacteria and fungi pathogens. After two days, boil or steam the mix to a temperature of 85°C to 100°C for 45 to 60 minutes (be sure that the whole mix reaches this temperature). Afterwards, when the mix has cooled down, add 10 grams of DAP for each Kg of the mix – the fertilizer should be dissolved in water and then well mixed - to provide some starter nutrients for the seedlings.

Sterilizing the substrate mixture.



Use of a marker to make uniform planting holes.

6. **Trays and Substrate**: The substrate should be uniform when filling the trays; it should not be compacted.

7. **Seed planting**: Holes are made in the middle of the cell; the depth will vary depending on the size of the seed, but in in general the seed is placed at a depth of 2.5 times its length. It is essential to make the holes at the same depth to ensure a uniform germination. A marker should be used to make the holes.

8. **Watering and Preparation:** Sufficient water is required to wet the cells to the base, until drops can be seen coming from the bottom holes. The trays are then wrapped completely with black plastic (germination chamber) and placed under shade. Under these conditions the germination rate and uniformity will be better. The germination time will depend on the crop:

    - Cucumber: 2-3 days
    - Chilies: 3-5 days
    - Cabbage: 3 days
    - Lettuce: 2-3 days

Use of plastic (black is better) as germination chamber.

9. **Germination**: The trays should be checked at least three times a day until they reach the recommended time to unwrap them. As soon as the first seed germinates, the trays should be unwrapped and placed on the stands until all of the seeds germinate (48 hours maximum). During this period, a light watering will be required three times a day as the substrate should be maintained humid. After the first 48 hours, a heavy watering is required until the water drops come from the bottom of the trays.

10. **Irrigation:** Daily irrigation is required with alternate heavy and light watering. Use a gentle shower or watering can to prevent washing out the substrate. On the first day, water sufficiently until drops come from the base of the trays; on the following day a light watering is required, followed by a heavy watering the next day. The ideal time of day to irrigate is at 11:00am, but no later than 3:00pm to avoid *damping off* problems. If watering cannot be done until after 3:00pm, it should be a light watering. In hot or windy conditions it may be necessary to provide an additional light watering in the same day.

Wetting the seedlings with a pressure sprayer (gentle).

When preparing the transplant plot, wet it very well.

Very uniform seedling just two days after transplanting.

11. **Fertilization:** Twice per week fertilization is required starting the ninth day after sowing (be sure to leave a few days between fertilizations) using the following fertilizer: 20-20-20, 2 grams per liter of water.

    Apply the fertilizer on heavy watering days (first apply the fertilizer and then irrigate), so as to not accumulate salts in the plug that can eventually burn the seedlings.

12. **Disease Control:** At this stage plants are very sensitive to disease and pest problems. Check them three times per day and as soon as you see a plant affected by a pest check every seedling and the nursery surrounding to find the source and eliminate it. If you see some plants dying and with the stem dry, consult with your HARVEST technician to define a spraying program because the seedlings may have a fungal disease.

13. **Preparation**: Two hours before transplanting a heavy watering is required to allow the easy removal of the seedlings from the trays.

14. **Transport**: Care should be taken during transport to avoid damage. Plantlets can be transferred to plastic crates or cartons if necessary. Do not take trays to the field because they can be contaminated with diseases.

15. **Monitoring**: Most crops take 12 to 28 days between the planting of the seed and transplant. During this period, farmers should visit the nursery at least three times per day (morning, noon and afternoon). Plantlets should not be kept in the greenhouse for longer than the required period.

16. All field preparation should be done either before or when the seeds are planted to ensure that everything is prepared for transplanting day.

17. Plantlets should not be kept in the field for more than 24 hours prior to transplanting to avoid damage.

Damaged seedlings that were kept in the field more than 24 hours.

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